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ABSTRACT

Evidence of tension between teachers and researchers regarding the work that researchers undertake in classrooms surfaces from time to time. The title of this conference, "A Conversation between Researchers and Practitioners", testifies to the importance of interaction between the users and providers of research. Indeed, in this paper, we will argue that the traditional role-pair interactions, which may be the cause of the tension, can be replaced with what we will call a "blended role-pair." This blend, we suggest, merges research and action, connects the researcher with the researched, and combines the ownership of the knowledge produced from the research. Further, the unique nature of working with adults learning mathematics (ALM) allows a similar role- pair blending to take place between practitioners and students. The symmetry of the problems associated with traditional teacher-pupil role- pairs and those associated with traditional researcher-practitioner role-pairs allows us to consider a symmetrical response. This blended role-pair, we suggest, merges presentation and construction of mathematics--all concepts in the best tradition of the ALM community. Further, we will speculate that the triangle of role-pairs can be completed by considering the researcher-student pairing and whether a similar blending can be usefully developed. (Author)

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Whose Thinking Is It Anyway? Role-Pair Blends in the ALM Community

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Evidence of tension between teachers and researchers regarding the work that researchers undertake in classrooms surfaces from time to time. The title of this conference—"A Conversation between Researchers and Practitioners"—testifies to the importance of interaction between the users and providers of research. Indeed, in this paper, we will argue that the traditional role-pair interactions, which may be the cause of the tension, can be replaced with what we will call a "blended role-pair." This blend, we suggest, merges research and action, connects the researcher with the researched, and combines the ownership of the knowledge produced from the research.

Further, the unique nature of working with *adults* learning mathematics allows a similar role-pair blending to take place between practitioners and students. The symmetry of the problems associated with traditional teacher-pupil role-pairs and those associated with traditional researcher-practitioner role-pairs allows us to consider a symmetrical response. This blended role-pair, we suggest, merges presentation and construction of mathematical knowledge, connects the teacher and the learner, and combines the ownership of the mathematics—all concepts in the best tradition of the ALM community. Further, we will speculate that the triangle of role-pairs can be completed by considering the researcher-student pairing and whether a similar blending can be usefully developed.

Traditional Pairings

Skemp (1979) introduces the notion of the role-pair. He defines the concept of a "role" as a schema that is brought to bear in a particular situation, delineating the forms of interaction the person can have with others in this situation. Other researchers have called this a script (Shank and Abelson, 1977) or a frame (Davis, 1982; Minsky, 1975). In each case, the role is a mental structure (evoked by a given situation) that brings with it certain expectations, certain degrees of freedom, and certain degrees of restriction. A doctor, for example, has the freedom to ask their patient to submit to investigations that would not be permitted in other roles and, with those freedoms, come restrictions about what the doctor may *not* do. Of course, this example amply demonstrates that the role is not absolutely fixed, nor is it made completely explicit (even where some culture imposes quite rigorous legislation).

Skemp notes that most roles in fact form half of a role-pair. The doctor's role is matched by a role played by the patient. Each half of the role-pair has a "script" of freedoms and restrictions. The lack of an entirely deterministic script on either side inevitably leads to some possible conflict in even very well defined role-pairs, but generally the two scripts are roughly compatible.

Of course, the role-pairs of most interest here are the teacher-student and teacher-researcher pairings (and, at the end, we will briefly consider the research-student pairing). In the teacher-pupil role-pair, which Skemp examines in the traditional context of the compulsory schooling of children, each side of the role-pair has a script which indicates, to some extent, what the other side should be doing.

For example, in the traditional caricature of teaching, the teacher's script contains expectations that pupils will attempt to do the tasks which have been set, while the pupil's script contains expectations that the teacher will set tasks from which they will learn. Within this traditional caricature, the pupil's script may contain the

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expectation that the teacher has a complete command of the subject matter while the teacher's may contain the expectation that their expression of their knowledge is to be accepted as fact. Brousseau and Otte (1991) call the set of expectations and restrictions in a teacher-learner situation the "didactic contract." In situations in which the behaviour of either the teacher or the pupil moves outside that set by the corresponding script, a conflict can be caused (Moshovitz-Hadar, 1993).

Of course, in different classrooms quite different didactic contracts are negotiated and different forms of role-pair are developed. Later, we will suggest that the opportunity exists in the ALM classroom to form a "blended" role-pair in which the ownership of knowledge is shared, the traditional sharp teacher-pupil distinction blurred, and the construction and presentation of knowledge are shared.

We have argued elsewhere (Duffin & Simpson, 2000) that blending can similarly address some of the perceived problems of traditional researcher-practitioner role-pair. Saul (1995) writes of his concern for the value of mathematics education research to him, "having searched the standard journals in vain for insights" into his classroom. This concern tells of his perception of the separation between himself and those who publish in standard journals. Some of those, having moved from school teaching to university lecturing, recall this sense of separation: Day (1995), for example, "never knowingly read a research paper" as a teacher.

There is little doubt that if teachers can get access to the results of educational research, can relate it to their classroom practice, and can modify that practice in ways they feel is warranted by the work, it can be of great benefit. Saul and Day highlight the problem that this access is far from simple. It may well be the case that research is not easily available to practitioners, because it is published in journals housed in university libraries that not all can access rather than in the professional journals read by practising teachers. Moreover, the language of academic journals tends to be that developed for the sharing of information between researchers and their peers rather than being in the linguistic register of the practising teacher. Indeed, even within the research domain, some work can be inaccessible to other researchers where very specific language has been developed by a particular group within the whole research community so it is not surprising if teachers find research difficult to read.

These concerns seem to fit with the caricature of traditional research paradigms. Grundy (1994) highlights his concerns about this type of research. Along with other criticisms, he notes that much research:

- separates research from action;
- separates researcher from the researched; and
- gives the ownership of knowledge to the researcher and not the practitioner.

Wright (1997) notes similar concerns about this traditional pairing: the researcher "represents the 'other'"—through their writings they speak with their voice about another's culture.

Working from the ideas of Daly (1970) we have elsewhere noted that traditional forms of research render some legitimate questions about the teaching and learning process invisible. For example, in accepting only quantitative evidence as significant (Tooley, 1998), whole areas of concern including those which may be of direct relevance to classroom practitioners may be dismissed.

Day notes a further concern that he sees particularly in newly appointed education lecturers. Traditionally recruited directly from successful school teaching, they are required to satisfy the research requirements of their new job. However, as Saul's and Day's comments indicate, the caricature role-pair script they bring with them from their positions as teachers may contain the very concerns raised by Grundy as expectations for research!

We are not suggesting that Grundy's concerns apply to all educational research. Indeed, the field of action research, particularly where the researcher and the practitioner are the same person, clearly avoids Grundy's points completely. Similarly there are cases such as Jaworski (1994) and Nolder (1992) who moved from being

successful classroom practitioners to roles as university researchers and, in doing so, brought with them a sensitivity to the views and concerns of teachers which became an integral part of their research.

Our Way of Working

While Day provides one possible answer to Grundy's concerns through the adoption of an action research framework, we will suggest an alternative strategy. We offer this model as a generic example of collaborative working which could be adapted by others to their situation.

The development of our way of working came from a shared interest—initially in just one piece of work. Our interest in the work of an 8 year old girl in developing a general method for squaring numbers led us to share our views (Duffin & Simpson, 1991). In doing so, we found that the root of our interest in the work was profoundly different. One of us focussed on the formal generalisability and efficiency of the mathematical algorithm. The other focussed on the way in which the pupil had come to develop the method for herself based on her experience of a distinctive teaching style (within the CAN project described by Shuard, Walsh, Goodwin, and Worcester, 1991, and Duffin, 1996).

The fact of these wildly contrasting perspectives became almost of as much interest as the girl's work and we began to focus on how our own backgrounds had influenced our reaction to the pupil's work (in the same way that the pupil's background within the distinctive teaching style had influenced her methods).

At this time, it was not clear to us that we were doing research. However we were prompted through our conversations with others to reflect on the ways in which we worked to develop our ideas.

In doing so, we saw three characteristics to our way of working:

- Introspection: the consideration of our personal reactions to any episodes or issues we investigate.
- Co-spection: the sharing of those personal reactions so as to arrive at a composite view of the experience we are investigating.
- "As if from inside": the attempt to see the situation from the viewpoint of the learner.

These three characteristics allow us to *blend* our roles. Introspection allows us to examine the way in which our own background and examinable mental schemas influence our reactions to situations. In doing so we have some sense of direct access to the ways in which internal mental structures manifest themselves as external behaviour. Clearly the problems associated with this mirror those highlighted by Watson (1913) in the early development of scientific approaches to psychology. However, these are countered by combining introspection with the other two characteristics. With "co-spection" we begin by sharing our personal reactions and the explanations from our introspection. In doing this we gain access to another (usually quite different) perspective on learning and behaviour. However, co-spection goes beyond this to attempt to develop a "fused" perspective in which both explanations join together to give a richer interpretation of the incident under discussion.

With the final characteristic, "as if from inside," the three different perspectives (two introspective and one fused co-spective) on the ways in which internal structures manifest themselves as external behaviour allow us to ask a question of the learning incident we see. What internal mental structures might this learner have which would explain the external behaviour? In doing this, we can observe a learner "as if from inside."

Blending the Researcher-Practitioner Role-Pair

These characteristics, developed over the years of the research partnership, result in a role-pair which no longer has the sense of distinct elements (with different obligations, rewards, and behaviours) in Day's description of traditional, separate researcher-researched role-pairs.

Any particular implementation of this model relies on the individuals within the role-pair. Clearly the distinct forms of explanation generated through introspection are, of necessity, unique. We do not believe, however, that

this prevents the general form of the model being adapted to blending the user/provider role-pair in other situations.

Within the ALM community, the researcher-practitioner role-pair provides excellent nourishment for the growth of this model. The personal explanations generated by introspection will probably come from quite different perspectives. The sharing of the explanations, through co-spection, will rely upon both the intimate involvement with the classroom culture of the teacher and the research culture of the researcher. This fused perspective could give a much clearer insight into the ways in which internal mental structures manifest themselves, in the classroom context, as behaviour.

Clearly the blended role-pair produced is based on the different perspectives, formed through introspection and shared through co-spection. Thus each role-pair formed brings a set of lenses through which to view incidents "as if from inside."

Facing the Concerns

In its ideal form, the model proposed addresses the three concerns set by Grundy.

Because our way of working results in a shared perception of incidents and learning episodes encountered, practitioner and researcher would be able to perceive classroom episodes with a shared perspective. This would mean that the teacher's knowledge of their classroom would now be shared more fully with the researcher who would therefore no longer be separated from the researched, for the researcher would now be in a position to see the issues which concern the practitioner through that shared perspective. This does not mean that either lose their personal perspective but that, in the fusion of perspective that comes from the collaboration, each would have a new enhanced perspective that includes both their original perspectives. Thus the blended role-pair is as much a part of the teacher's classroom as the teacher is and the separation of researcher from researched is removed. Further, the blending of the role-pair also addresses Wright's concerns about "representing the 'other'"—the practitioner is no longer the "other" in the role-pair and, as Wright suggests in her work, can develop the skills of being a researcher themselves.

By taking part, with the teacher, in what goes on in the classroom, and with the shared perception that they would have developed, the research undertaken would become part of the teacher's action, now shared with, and by, the researcher. So the traditional problem of the researcher coming into the classroom to find answers to their own research questions which had little connection with the teacher's classroom concerns will be subsumed in their now common purpose and interest. It would make the agenda a commonly perceived one rather than being that of either the researcher or the teacher, as separate people. Thus the actions of the blended role-pair are the unified actions of teaching and researching.

Similarly, because knowledge is constantly and repeatedly being generated and shared between researcher and teacher so that it becomes the possession of both, both will own the research, both will be dedicated to the pursuance of the questions to which they both want answers, and both will own the knowledge they gain from the research. Indeed, rather than seeing the knowledge as equally shared (which implies a fair *division*), the *whole* knowledge and its situation within the classroom and research cultures are owned by the blended role-pair.

Adapting to *Adults* Learning Mathematics: Blending the Practitioner-Student Role-Pair

The opportunities afforded by constructing blended role-pairs in this way have particular significance for the ALM community. The role-pair described by Skemp (1979) in a traditional school setting is, in his terms, an "imposed" role-pair. The pupil is required by law to attend the school and the didactic contract and the scripts developed for both sides of this role-pair are carefully maintained by the disciplinary structures of the school culture.

By contrast, the role-pair in the ALM community is "elective." While the learners may have a wide variety of reasons for wishing to study mathematics, some of which may be seen by the learner as an imposition, the

teacher is probably not a part of structure which imposes. Inevitably, in the absence of an alternative, part of the script which has been developed in school may be used initially to try to understand the system when the adult learner returns to learning mathematics. Without negotiating a new didactic contract, the learner may still expect that the teacher should have complete command of the subject and that, as learners, they are expected not to question the teacher. Of course, other experiences from school may colour the initial script with which they return to learning mathematics: every question has one, and only one, correct answer (Copes, 1982); mathematics is hard (Buerk, 1982), and learning means precisely recalling the correct procedures to implement in the appropriate contexts.

Thus, the model of collaboration we have developed to blend the researcher-practitioner role-pair may be adapted to helping blend the teacher-learner role-pair and assist in the negotiation of a new didactic contract. In the researcher-practitioner blended role-pair described above, introspection involves the participants in the careful examination of their own ways of thinking. This has just as useful a function to play in constructing a blended practitioner-student role-pair. The fact that the students are adults means that they are much more likely to be able to reflect carefully upon their learning and try to make sense of it.

The sense made by both students and teacher in looking at their own ways of thinking about a particular piece of mathematics can then be shared through a practitioner-student version of co-spection. As the learners recount their own ways of thinking and listen to others, including the teacher, they may begin to question the traditional "mathematics lesson" expectation. In the elective role-pair of adult learners and practitioners, the sharing of thoughts and feelings can be value-free. This co-spection may enable the learner to blur the boundary between the teacher as having complete command of their subject content and themselves as having poor command.

The final component of the blended researcher-practitioner pairing is "as if from inside." In the practitioner-student pairing, the sharing of ways of thinking about a piece of mathematics through co-spection certainly may help the practitioner construct models of the students' ways of thinking. However, the adult students can also construct models of the ways of thinking of their peers, including the teacher. In doing so, they are constructing a wide variety of mathematical ways of thinking which they may choose to adopt.

The Calculator Aware Number (CAN) project in the 1980s and 1990s in the UK implicitly adopted some of the constructions we have suggested here (Shuard, Walsh, Goodwin, & Worcestor, 1991). In providing young pupils with calculators and in instructing teachers to avoid teaching standard arithmetic algorithms, the project encouraged a non-directive, listening, and observing style of teaching. Pupils were involved in developing their own mental and written methods with the teacher as a guide and partner in those inventions. The children felt they owned their mathematics as much as the teacher did.

Possibilities: Blending the Researcher-Student Role-Pair

The nature of the learners as adults in ALM classrooms provides one more opportunity for a blended role-pair. Although it is a concern of standard methodological texts (Cohen & Manion, 1994), traditional research on learners in school almost obscures the issue of pupils' rights to the ownership of research. While permission is sought from the children (and their parents) and the results of the research may nominally be made available, there is an even stronger power imbalance in the traditional researcher-pupil role-pair than in the traditional researcher-teacher pair.

However, the ability of adult students to reflect on their thinking as outlined above gives the opportunity to blend this last role-pair in the triangle. In Aspinwall, Shaw, and Presmeg (1997), the mature student Tom is highly articulate about his thinking, is able to share some of the deepest aspects of his teacher and, to some extent, look back upon himself with some detachment (in a version of "as if from inside"). Ultimately, one could imagine opportunities for researchers and adult learners of mathematics to move through versions of introspection, co-spection, and "as if from inside" and produce research that is the genuinely co-owned product of a blended researcher-student role-pair.

The most obvious way in which we can see this happening is where the teacher takes on the role of researcher of their own classroom. In developing a partnership with her students, Tomlin (1998) encourages students to investigate their own thinking. Similarly, O'Hagan (1994) demonstrates an openness with her students and a sense of learning together which begins to blend their roles. Thus, even in the last role-pair under consideration, we may be able to see value from blending.

The triangle of researcher, practitioner, and student role-pairs, in its traditional form, separates knowledge and divides ownership. Blending role-pairs through the adoption of new ways of introspecting, co-specting, and examining others (and, paradoxically, ourselves) "as if from inside" allows knowledge to be connected and ownership of that knowledge to be combined.

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